An overview and nonmarket valuation of camping in the Foothills Model Forest

B.L. McFarlane and P.C. Boxall

Northern Forestry Centre
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foothills model forest
a growing understanding

Natural Resources Canada
Canadian Forest Service

Ressources naturelles Canada
Service canadien des forêts

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Le Service canadien des forêts de Ressources naturelles Canada est également partenaire principal de chacune des onze forêts modèles, et il fournit l'essentiel du financement et de l'appui administratif au programme des forêts modèles du Canada.

La forêt modèle Foothills est un partenariat extraordinaire devoué à fournir des solutions pratiques envers la gestion durable de nos forêts.

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Canadian Forest Service
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ABSTRACT

This study examines campers at provincial recreation areas and William A. Switzer Provincial Park to determine use and user characteristics and estimate the nonmarket economic value of camping. Data were collected from camping permits during the 1995 camping season. A zonal travel cost model employing count data econometrics was used to estimate nonmarket economic values associated with camping. Results showed that over 24 000 people camped in the model forest, and camping parties spent more than 16 000 nights in the model forest. Campgrounds were used primarily by Albertans. Most campers were from outside the model forest area. The campgrounds were used mostly as one-night stops or weekend and long weekend destinations. Differences were observed between campers at the provincial park and at the provincial recreation areas, suggesting the two types of camping opportunities are attracting different types of campers. The travel cost model estimated consumer surplus at about $58 per trip. The estimated benefit flow to Albertans derived from managed campgrounds in the Foothills Model Forest is $436 600 (in 1995 dollars) per annum.

RÉSUMÉ

Cette étude porte sur les pratiques de camping dans les aires de loisirs provinciales et dans le parc provincial William A. Switzer, afin de caractériser les types d'usages et d'usagers et de déterminer la valeur économique non commerciale du camping. Les données ont été tirées des permis de camping accordés lors de la saison de camping 1995. Un modèle de frais de déplacement selon les régions désignées utilisant des variables économétriques fondées sur des données d'énumération a servi à établir les valeurs économiques non commerciales associées au camping. Les résultats révèlent que plus de 24 000 personnes ont campé dans la forêt modèle et que les groupes de campeurs y ont passé plus de 16 000 nuits. La plupart des campeurs étaient des Albertains, et la majorité venaient de l'extérieur de la région où se trouve la forêt modèle. Les campeurs s'installent généralement pour une nuit ou pour une fin de semaine de deux ou trois jours. Plusieurs différences ont été observées entre les campeurs qui utilisent dans le parc provincial et ceux qui utilisent les aires de loisirs provinciales, notamment que ces deux sites attirent différents types de campeurs. Selon le modèle établi, le « surplus des consommateurs » se chiffre à environ 58 $ par visite. Les bénéfices générés par les terrains de camping de la forêt modèle Foothills, au profit des Albertains, s'élèvent à 436 000 $ (valeur de 1995) par année.

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INTRODUCTION

Natural resource management has evolved from a sustained-yield approach to "the integration of ecological, economic, political, and sociocultural insights into decision making that establishes goals for natural resources and initiates actions to achieve them" (Decker et al. 1996). The ecological dimensions have received the most attention and include the biophysical components that determine potential productivity and use. Economic aspects include market and nonmarket values and have been the dominant social value in management decisions. The political component includes laws, codes, and government policies. The sociocultural dimension includes the traditions, values, attitudes, norms, religions, and philosophies of various stakeholder groups. Sociocultural aspects determine the products of management that have value and management actions that are acceptable. Understanding these social aspects influences the choices of management goals and helps managers address the needs of stakeholders; thus, including the demands for renewable and nonrenewable resources in sustainable forest management requires an understanding of the values of various stakeholder groups.

Identifying and characterizing stakeholders and their values can be a complicated process. Stakeholders include many people with diverse values, interests and needs, and one of the obvious and traditional stakeholder groups comprises the users of the resource. Recreationists represent one of the major user groups of the Foothills Model Forest, one of 10 model forests that were established across Canada in 1992 and funded by Canada's Green Plan under the Partners in Sustainable Development Program. The purpose of the Foothills Model Forest is to improve methods of sustainable forest use and integrated resource management[1].

Very little is known about the recreationists at the Foothills Model Forest. Information useful for recreation planning, such as user numbers, has been collected in the past but does not provide adequate information for understanding recreationists' values. Natural resource managers need to know who the users are, how they will be affected by management decisions, and their interests and concerns (Decker et al. 1996). The first step in addressing these questions is to develop user profiles that, in addition to the number of users, includes how users are distributed geographically and over time, users' social characteristics, and the benefits derived from camping (McFarlane, Boxall, and Gartrell 1996).

A study was initiated in 1995 to examine recreational use in the Foothills Model Forest. The objectives were to determine attitudes toward forest management and resource management preferences, determine economic values for recreational activities, and develop recreation behavior models that predict changes in use patterns and economic values following changes in the forest landscape. Camping was chosen as an indicator of recreation use because of its prominence in terms of the number of users, and its distribution throughout the model forest, and because campers generally engage in multiple recreational activities such as fishing and hiking while staying in the forest (McFarlane, Boxall, and Gartrell 1996). This report presents results on campground use, spatial and temporal distribution of use, and social characteristics of users. It also examines benefits derived from camping using travel cost models that estimate the nonmarket economic value of camping.

[1]Foothills Model Forest. 1997. Foothills Model Forest Phase II proposal, Hinton, Alberta. Unpublished manuscript.

Study Area

The Foothills Model Forest consists of over 2.3 million ha situated in the foothills and Rocky Mountains of west-central Alberta and comprises primarily publicly owned land (Fig. 1). Jasper National Park joined the model forest in 1995 after this project was initiated and therefore, is not included in this study. The majority of the model forest outside of Jasper National Park is public land administered by the Province of Alberta and is managed for multiple use.

The Foothills Model Forest is composed of boreal, subalpine, alpine, and montane forest ecosystems. Characteristic species in the region include white spruce (*Picea glauca* [Moench] Voss), black spruce (*Picea mariana* [Mill.] B.S.P.), alpine fir (*Abies lasiocarpa* [Hook.] Nutt.), and lodgepole pine (*Pinus contorta* Dougl. ex Loud. var. *latifolia* Engelm.). Topography varies greatly across the model forest from low rolling rounded hills in the east to mountainous topography with steep slopes and high elevations nearing the Rocky Mountains in the west. The portion of the model forest used in this study includes the foothills of the Rocky Mountains, where mountain flora and fauna blend with that of the boreal forest to offer a unique outdoor experience different from either the Rocky Mountains or Alberta's boreal north.

The main access route into the forest is Highway 16, the Yellowhead Highway, which traverses the model forest in an east-west direction. The Yellowhead Highway is a major travel route originating in Ontario and passing through Manitoba, Saskatchewan, and Alberta, into British Columbia. Other paved access routes include Highway 40, which connects with Highway 16 near Hinton, and Highway 47, which connects with Highway 16 near Edson. Most other access is by gravel road; there are numerous gravel logging roads that provide public access to many areas in the model forest.

Hinton and other communities in the Foothills Model Forest such as Brule, Cadomin, and Robb, and the neighboring communities of Edson and Grande Cache, developed around the natural resources in the region. Forestry and energy dominate the area's economic base, making up over 90% of Hinton's economy, 58% of Edson's, and 80% of Grande Cache's.[2] Hinton is the largest community in the forest, with a population of 9046 (Statistics Canada 1991). Hinton dates back to the early 1800s when it was a fur-trading area, but was not established as a town until 1958. The community grew around the forest industry with the establishment of Alberta's first pulp mill in 1955. Weldwood of Canada Limited, Hinton Division, currently operates the mill. Weldwood recently expanded and updated the mill and added a sawmill to its operations.

Coal mining is an important industrial activity south of Hinton[3] and has a history dating back to the turn of the twentieth century. The Coal Branch area, which consists of several coal-mining communities such as Cadomin and Robb, is of historical and cultural significance in the area. Many of the original coal-mining towns such as Mountain Park have disappeared because of changing technology and decreased demand for coal; however, there are still three open-pit mines that make a substantial contribution to the local economy and a proposed expansion of one mine is currently under consideration. Near Cadomin is a rich limestone deposit that has been mined for about 50 years. Natural gas exploration and development are prominent in the area. A gas pipeline that supplies markets in Canada and the United States is also situated in the model forest.

In addition to resource-extraction opportunities, the area has spectacular scenery, abundant fish and wildlife, and a wealth of recreational opportunities that are enjoyed by local residents and tourists. Jasper's economic base depends on the income and expenditures from the nonconsumptive use of natural resources associated with recreation and tourism. Hinton is located on a travel corridor linking Alberta with British Columbia and provides access to Jasper and Banff national parks. While not a major tourism

[2,3] Korber, D. 1995. Socio-demographic and economic profile report and data. Nat. Resour. Can., Can. For. Serv., North. For. Cent., Edmonton, Alberta. Unpublished manuscript.

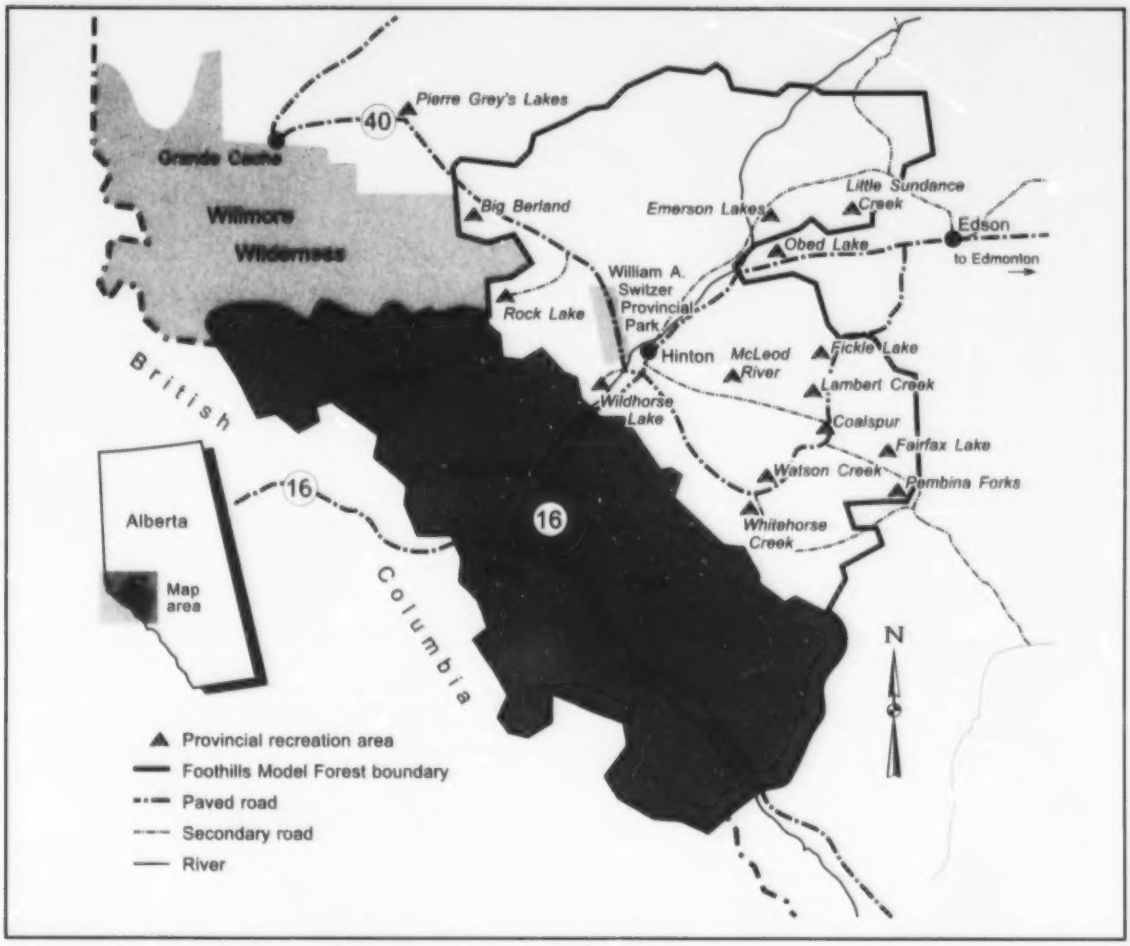

Figure 1. Location of the Foothills Model Forest and study sites.

destination, the area around Hinton has tourism potential. Thirty-eight percent of lands within a 100-km radius of Hinton are currently protected or reserved from resource extraction by legislation or are designated as prime protection areas (Foothills Forest, no date). Areas protected by legislation within the model forest include Jasper National Park and William A. Switzer Provincial Park; there are also several areas with designated or proposed natural area status. Land-use restrictions in natural areas vary, but can include resource extraction.

In an attempt to balance these varied and sometimes conflicting uses, protect sensitive environmental areas, and preserve wildlife habitat, the Alberta Government adopted the Eastern Slopes Policy on integrated resource management in 1977. The policy guides land allocation in the region to provide for the maximum delivery of the full range of values and opportunities to all Albertans (Alberta Energy and Natural Resources 1984). Under the policy, provincial public lands in the model forest are categorized into eight land use zones ranging from prime protection zones, which protect environmentally sensitive terrain and valuable ecological and aesthetic resources, to facility zones, which support settlement and commercial development. The Foothills Model Forest advances the concept of integrated resource use by fostering partnerships among stakeholders and developing and promoting sustainable management mechanisms.

Provincial Recreation Areas

Provincial recreation areas were first established in the early 1960s by the Alberta Forest Service in response to concern over wildfires resulting from careless use of campfires and the environmental impacts of people camping at random in the forest (McFarlane, Dolphin, and Boxall 1996). Provincial recreation areas were established at the more-popular random camping sites and provide a semiprimitive camping experience. The campgrounds have drive-in sites with picnic tables, fire pits, and gravel tent pads. Other facilities common to the campgrounds include pit or vault toilets, firewood, and water pumps. The level of development, quality of facilities and variety of recreational opportunities are relatively homogeneous across the provincial recreation areas. Some campgrounds have special attractions nearby, however, such as the Cadomin Caves near Whitehorse Creek, or include lakes stocked with trout (e.g., Wildhorse Lake).

In general, provincial recreation areas differ from campgrounds found at provincial and national parks in that they are less-developed, provide fewer services and facilities, and charge lower camping fees. When provincial recreation areas were first established, there was no fee for camping. In 1992, the Alberta Forest Service began charging for campground use. The fee ranged from $5.50 to $7.50 a night, with firewood supplied free of charge. In 1994, the fee was increased to a range of $7.00 to $9.00. In 1995, operation and maintenance of Fickle Lake, Lambert Creek, Little Sundance Creek, and Emerson Lakes were privatized. Following this move, Fickle Lake and Lambert Creek charged an $8.00 fee, and firewood was sold for $4.00 a bundle by the operator.

William A. Switzer Provincial Park

William A. Switzer Provincial Park was established in 1958 and at that time was known as Entrance Provincial Park. The park was renamed William A. Switzer Provincial Park in 1974. The park is owned and operated by Alberta Environmental Protection, Parks Services. The 2688 ha park is located about 20 km northwest of Hinton on Highway 40. The park is a protected area, and, therefore, activities such as industrial use, hunting, and the use of off-highway vehicles and horses are not permitted. The park has a chain of five lakes connected by Jarvis Creek and offers a variety of water-based recreational opportunities. Excellent canoeing opportunities exist for the beginner. When the water is high, it is possible to canoe Jarvis Creek to all five lakes during a one-day outing.

William A. Switzer Provincial Park offers a different camping opportunity from provincial recreation area campgrounds. Five campgrounds are located within the park, and they vary in service level from basic service to full service with electrical hookups, showers, and dump stations. Prices vary from $7.00 to $15.00 a night, depending on the level of service provided. The park offers firewood for sale by a private vendor at $5.00 a bundle, delivered to individual camp sites. Playgrounds, interpretive services, several day-use areas, hiking trails, and a privately operated adventure lodge are also found within the park. Camp sites may not be reserved in advance, and are assigned on a first-come, first-served basis.

Data Collection

Data were collected in 1995 from campgrounds at provincial recreation areas and from William A. Switzer Provincial Park. Data were collected primarily from self-registration permits[4] (McFarlane, Boxall, and Gartrell 1996). Campers were required to pay a camping fee by means of an envelope, upon which they were requested to respond to a few questions and deposit the envelope at a registration kiosk. Camping permits collected information on the number of people in the camping party, the number of previous visits to the campground in the last 10 years, respondents' home postal codes, dates and number of nights stayed, vehicle license numbers, surnames, provinces or states, and camp site numbers. Two provincial recreation areas (Fickle Lake and Lambert Creek) were privately managed and used a different permit design from that used by the Alberta government. That permit did not collect data on the number of previous visits to the campground in the

[4] Because of differences in reporting methods, the user numbers in this study might not be identical to user statistics kept by Alberta Environmental Protection.

last 10 years, but did collect information on the type of camping equipment used by visitors. In addition to a self-registration system, Gregg Lake campground in William A. Switzer Provincial Park maintained a staffed registration booth on weekends and long weekends during July and August. These registrations collected the same information as the permit system and data on the type of camping equipment. Data from this registration system were obtained from carbon copies of the original registration forms. About 750 of these entries were illegible and could not be included in the database.

Registration envelopes were collected from 15 provincial recreation areas and the five campgrounds in William A. Switzer Provincial Park (Fig. 1). Two of the provincial recreation areas located outside the model forest, Pierre Grey's Lakes and Obed Lake, were included because of their close proximity and potential importance in providing camping opportunities. Data were collected from May to October, 1995, the duration of the fee collection season. A total of 10 498 registrations were recorded. An additional 130 registrations were filed at the Fickle Lake and Lambert Creek provincial recreation areas, but the registration envelopes were not available for data entry and these registrations were therefore excluded from the analysis.

Visitors on multi-day trips had the option of paying on a daily or a multi-day basis, therefore, not every registration represented a unique trip. Thus, it was sometimes necessary to combine registrations into single trips. This was only possible for those registrations with the vehicle license numbers, the dates, and the number of days or fee paid. Registrations were combined into a single trip for each campground if, for a given vehicle license number, the purchase date plus the number of days paid was only one day short of the next purchase date. If there was a break of at least one day not paid for, then the registration was considered a new trip. Multi-day trips across campgrounds were not combined. For example, a visitor spending one night at Whitehorse Creek and the next night at Graveyard was considered to have taken two trips. Combining multiple visits in this manner resulted in 8732 trips reported by the 10 498 registrations.

The origin of each camping party was classified as: Alberta, other Canadian provinces, United States, or other country. Origins were delineated further into market areas for Alberta residents with a valid postal code. The postal code was used to identify campers from Hinton, Edson, Grande Cache, Edmonton, Calgary, other cities and towns, and rural areas.

The postal code for each camping party also allowed an estimation of campers' socioeconomic status. Estimates for socioeconomic data were obtained from the 1991 Canadian census data (Statistics Canada 1992). For each postal code, data on total population, age structure, average household size, total lone-parent families, education, unemployment rate, and household income were obtained from the 2A and 2B profiles of the census.

Using the postal code conversion file from the census data, the postal code from each record was linked to the corresponding enumeration areas of the 1991 census (Statistics Canada 1992). Enumeration areas represent the smallest census geographic unit. Only records with an Alberta postal code were linked with the census data because similar census data were not available for most postal codes in other provinces and countries.

Of the 7510 records with an Alberta postal code, 6830 matched a postal code in the postal code conversion file. The remaining postal codes were either missing or were invalid codes in the postal code conversion file. Each postal code could consist of several enumeration areas because every enumeration area was included that partially or wholly intersected a postal code. When matched with corresponding enumeration areas, therefore the resulting census data file contained 29 722 records. Enumeration areas then had to be collapsed to obtain one census record for a postal code. It was not possible to weight socioeconomic data by the proportion of the enumeration-area population intersecting a postal code. Socioeconomic estimates for an individual were therefore based on information from all individuals occurring in every enumeration area that corresponded to each individual's postal code. For example, to obtain the total population in a postal code, the populations were summed across all

enumeration areas that partially or wholly intersected the postal code, and to obtain average household income, the mean of the average household income was used for all enumeration areas that partially or wholly intersected the postal code. Linkage of the postal codes with enumeration areas allowed the estimation of a geographic location for each postal code (Boxall et al. 1996). Using Geographic Information Systems technology, travel distance was calculated from each postal code to the Foothills Model Forest. This travel distance was used in the estimation of travel costs from each registrants' postal code to the model forest.

The Travel Cost Model

Public land in Alberta provides numerous goods and services to the citizens of the province and people from elsewhere. Unfortunately, most of these services are not traded in economic markets; consequently, true prices do not exist for them. The result of this absence of prices is that many of these nonmarketed services are not appropriately considered in the management and allocation of public lands. Market and nonmarket services provide benefits to consumers, thus complete examinations of the sustainable development of public lands must consider both types of services. Maximizing the net present value of public land should consider the associated marketed and nonmarketed goods and services flowing from the land base, as well as any positive or negative interactions between them. To utilize this concept in an accounting framework example, the values of service flows of nonmarket goods and services (in other words, the income generated by them) should be fully considered in the construction of regional, provincial, and national income accounts[5]. Typically this does not occur, resulting in many forest benefits being under valued in decision making.

An important nonmarket service provided by public land in Alberta is camping. This activity is not currently priced in an economic market. Unlike timber products or hotel visits, the fees collected by managers of these areas are not measures of prices because they are not determined by market forces. Campers' expenditures on equipment, food, and transportation are also not considered relevant prices because they are associated with the costs of related goods and services, not the benefits of camping in public land. Furthermore, the money spent by Albertans on camping would simply be spent on something else if camping opportunities disappeared. Thus, specific procedures must be used to estimate the economic values associated with camping on public land.

This problem was an early concern of the U.S. National Parks Service. Park managers were interested in valuing the unpriced services in order to understand the magnitude of the full spectrum of economic benefits provided by National Parks. In 1947, Harold Hotelling outlined what is now called the travel cost model (U.S. National Park Service 1949). Hotelling's idea was that recreationists incur costs to visit recreation sites that vary in relation to the distances they must travel between their residences and the recreation sites. Using an assumption of weak complementarity between the cost of a private good (travel) and the availability of a recreation site (a publicly provided campground, for example), the travel costs can approximate the true prices of trips to sites. At different prices (i.e., distances) different quantities (numbers of trips) will be consumed (taken) to the site and these price-quantity variations identify a demand curve for the site. Rosenthal et al. (1984) provides an excellent elaboration of this concept.

In original formulations, recreationists were considered homogeneous in all respects except locations and perhaps socioeconomic characteristics, were widely dispersed geographically, and were transported to the commodity for consumption rather than the reverse. Stated in formula terms, for a recreation site j, each recreationist faces a price p_j with two additive components: a user or entrance fee, p_e, and a transport cost, t_j. This final component is related to transportation (and therefore distance), and is thus a factor that varies according to the origin of a recreationist. However, this transport cost should include not only the out-of-pocket expenses of travel, but also the costs of time spent traveling. An assumption of travel cost models is that most recreationists could be doing something else (specifically working at some wage) instead of traveling to a site

[5] This is one aspect in what is called green accounting (Pearce and Warford 1993).

(Cesario 1976). Therefore the value of time must be considered in estimating this cost. Thus, people who live at different locations will face different prices for the site due to the variation in the distance (out-of-pocket costs) and their individual characteristics (value of time). Summing the quantities of trips demanded for the site at the prices described above yields an aggregate demand curve from which benefits can be derived using conventional economic theory.

While several approaches could be used to estimate the recreation values, the travel cost model approach used in this study was developed by Hellerstein (1991) and adapted by Boxall et al. (1996) for Alberta provincial recreation areas. This approach is the zonal form of the travel cost model. This model involves aggregating recreationists into some well-defined geographic units (zones) denoted by i, and uses visitation and socioeconomic data based on the zonal origins in the travel cost analysis. The traditional zonal analysis proceeds by regressing the visits per capita from each zone to the recreation site against travel costs and other variables. This can be represented by:

$$v_i = f([TC_i + p_e], S_i) \quad (1)$$

where v_i is visits per capita from zone i to the site, TC_i is the full cost of trips to the site from each zone, and S_i is a vector of socioeconomic characteristics of individuals in zone i. The total number of visits to the site is $\sum_i (Pop_i v_i)$, where Pop_i is the population of zone i. Once this demand curve is estimated, the benefits provided by the site are estimated by calculating the area under the demand curve (consumer surplus) or:

$$B = \int_0^{P^*} V(P_i, S_i)\, dP \quad (2)$$

where P_i represents $(TC_i + p_e)$ and P^* is the price at which visits to the site are estimated to be zero (the intercept on the price axis of the demand curve or the choke price).

This zonal model is well-known and has formed an important historical foundation for the estimation of nonmarket recreational values (Rosenthal et al. 1984; McConnell 1985; Fletcher et al. 1990). Fletcher et al. (1990) outlines some of the important theoretical issues associated with the aggregate approach. The most serious issue is the assumption of homogeneity or similarity of preferences among the individuals in each zone. To address this issue, travel cost models have been developed that use individual recreation trip data and characteristics. The individual approaches to travel cost models will be used in future analyses of recreation in the model forest.

There have been many developments in the travel cost literature. One of these is the use of count data estimators by Smith (1988) and Creel and Loomis (1990) instead of common linear regression procedures in estimating the regression model. These models explicitly recognize the count nature of trip demand in that recreation trips can occur only in nonnegative integer quantities. This is in contrast to other travel cost models, which use ordinary least-squares regression models that allow negative and non-integer trip quantities and, with certain functional forms, cannot include zero trip quantity decisions.

Hellerstein (1991) introduced the use of count data models in zonal travel cost analysis. Hellerstein used aggregate data in estimating the value of recreation in the Boundary Waters Canoe Area in northern Minnesota. He faced a problem in using permit data that did not contain information on the number of prior trips by individual visitors. He combined zip-code-level data into county-level aggregates. In order to use this approach, the dependent variable in equation (1), (v_i), becomes the total trips from the zone instead of trips per capita.

Two issues arise with this method. The first involves weighting to account for the varying population sizes of the zonal units. Hellerstein's (1991) aggregate travel cost model provides a good guide to this weighting issue. Weighting is related to the assumption that individuals within each zone are homogeneous in terms of travel costs and socioeconomic characteristics (Fletcher et al. 1990). The population of each aggregate unit must be included in the model by weighting each zone in the count estimation by its population.

A second problem in using a census of users from a permit database in a count analysis is that information is only captured from those

individuals who made a decision to visit the site. That is, there is no information collected from people who made zero trips to the site. This phenomenon results in truncated trip data, where the distribution of trips is missing below the value of 1. Hellerstein assumed a market area for the Boundary Waters Canoe Area, which included zero trip quantities from counties that did not visit the area.

Truncated count estimators, however, are well-known (e.g., Grogger and Carson 1991). In Boxall et al. (1996), these estimators were used in examining trips by postal code zonal aggregates to the Rocky-Clearwater Forest, located just south of the Foothills Model Forest. These estimators worked quite well and plausible estimates of the nonmarket benefits of camping at formal sites were estimated for the area. Because no market area is assumed in the current study, which focuses instead on Alberta and Albertans, this approach is applied to all Alberta residents contained in the permit database.

Variables for the Travel Cost Model

As previously noted, zonal travel cost model analyses involve regressing trips from some aggregate population unit on a set of independent variables using count data estimators. Two estimators are commonly used: the Poisson model, and its close relative, the negative binomial model. The choice between the two involves the degree of overdispersion in the data. Overdispersion refers to the extent of variability in the data, which is important in the case of the Poisson model where the mean is assumed to equal the variance. This assumption is relaxed in the case of the negative binomial model. In order to use these models in a travel cost analysis, three issues need to be addressed: the weighting problem; the choice of variables that reflect relevant socioeconomic differences between the zonal units; and the construction of the price or travel costs of a trip.

The weighting condition in a Poisson travel cost model means that trips from a zone containing W individuals can be modeled as a Poisson process with a parameter, λ, equal to the sum of the individual λ's across all W individuals in the unit. Hellerstein (1991) suggests that this sum ($\lambda_w = \sum_i^w \lambda_i$) is also Poisson-distributed, with the result that the distribution of trips is

$$\text{Prob}(Y = n) = (\exp^{-\lambda w})(\lambda_w)^n / n!$$

A mathematically equivalent method involves including the natural logarithm of each zone's population as an independent variable in the regression. This latter method was used in the Rocky-Clearwater Forest analysis (Boxall et al. 1996), and based on those results, the sign of the parameter on this variable *a priori* was expected to be positive, reflecting the fact that larger postal code populations result in larger numbers of trips to the forest.

The socioeconomic variables used as independent regressors are similar to those used by Boxall et al. (1996) for the Rocky-Clearwater Forest. These include an annual household income measure, the percentage of unemployed people residing in a postal code, the percentage with a post-secondary education, the percentage younger than 17 years of age, and the percentage older than 65 years of age. Prior expectations of the influence of these variables on trip frequency are unknown, although results from Hellerstein (1991) and Boxall et al. (1996) could be used as a guide.

Travel costs were imputed using standard travel cost estimation methods. This involved both the entry fee and the estimated costs involved in traveling to the area and also to a substitute area, the Rocky-Clearwater Forest. Substitute prices have been shown to be important in travel cost models (Rosenthal 1987). The following formula identifies the travel cost (TC) calculation:

$$TC = \$0.22 \times \text{dist} + [1/80 \times 1/3 \times (\text{income}/2040) \times \text{dist}] + [2 \times \$9.00] \qquad (3)$$

This formula identifies three components of travel cost: the out-of-pocket expenses for the vehicle, estimated at $0.22 per km; the opportunity cost of travel time, estimated at one-third of the wage rate (Cesario 1976); and the estimated cost of a typical stay at one of the campgrounds in the model forest or the Rocky-Clearwater Forest. The distance measure (dist) was estimated using Geographic Information Systems technology and involved the distance (in kilometres) from the

centroid of each postal code to Rock Lake in the model forest and to Fish Lake in the Rocky-Clearwater Forest. Note that in the second term, an average speed of 80 km/h was assumed, and that the wage rate involved income earned over 2040 hours per year. Other assumptions were that the number of nights spent at a park by a typical camping party was two and that the typical fee paid was $9.00 per night.

The sign for the parameter on travel cost to the model forest was expected to be negative, indicating that the farther away a postal code was from the forest, the fewer trips taken. The sign for the parameter on the substitute recreation area (Rocky-Clearwater Forest) was expected to be positive, supporting the notion that the closer one is to the substitute, the fewer trips taken to the Foothills Model Forest. These expectations of the influence of these parameters on visits result from economic theory, which predicts that the amount of a commodity purchased is negatively influenced by rises in its own price, yet is positively influenced by rises in the price of its substitutes.

In order to estimate these parameters, the number of visits from each postal code were regressed against the independent variables using the count data procedures contained in the LIMDEP 6.0 Econometric Software Program (Greene 1992).

RESULTS

Campground Use

A total of 8732 trips were made to the Foothills Model Forest campgrounds during the 1995 camping season (Table 1). Most of the camping trips (72%) were to the provincial recreation areas. The distribution of trips to the individual campgrounds shows that Pierre Grey's Lakes and Gregg Lake received the largest proportion of total trips (16% each), followed by Fickle Lake (9%), and Whitehorse Creek (8%).

A total of 16 352 nights were spent by camping parties in the model forest (Table 1). On average, camping parties spent 1.88 nights at the campgrounds. Many users (49%) spent only one night; 44% spent two or three nights, and only 7% spent more than three nights during a camping trip (Table 2). This suggests that the campgrounds were used primarily as one-night stop-overs or as weekend or long weekend trips, and few campers spent a long vacation at the campgrounds. The distribution of trips across week days, weekends, and long weekends supports this conclusion. The greatest number of trips occurred on weekends and long weekends (Figs. 2–6). The July long weekend (June 30–July 2) saw the highest number of trips (555) of all weekends and week days (Fig. 3). More trips occurred in July than in the other months with a total of 2583 trips (Fig. 7). This represented 30% of the total camping trips to the area. June, which is usually considered shoulder season (i.e., not the peak season) for camping, received a proportion of total trips (23%) almost equal to the trips taken in August (24%), suggesting that camping in the model forest extends beyond the peak months of July and August.

The number of camping trips to the campgrounds by individuals was determined by examining the number of occurrences of the vehicle licence numbers. This analysis assumed that a vehicle license number was attributed to one individual and that each occurrence of the vehicle license number represented a unique trip. While this might not be true, it is the best indicator available for individual or household use, though, results should be interpreted with caution. About 84% of the visitors made only one camping trip to the model forest (Table 3). Others made from 2 to 17 camping trips to the area during the 1995 camping season.

Origins and Market Areas

Most visitors were from Alberta (89%), followed by other provinces (7%), the United States (2%), and other countries (2%) (Table 4). Obed Lake, Wildhorse Lake, and Cache Lake received a larger proportion of out-of-province visitors with 49%, 20%, and 20%, respectively. Obed and Wildhorse Lakes are located on or near Highway 16 (the Yellowhead Highway), a major highway linking Manitoba and Saskatchewan to Jasper National Park and British Columbia. This could be

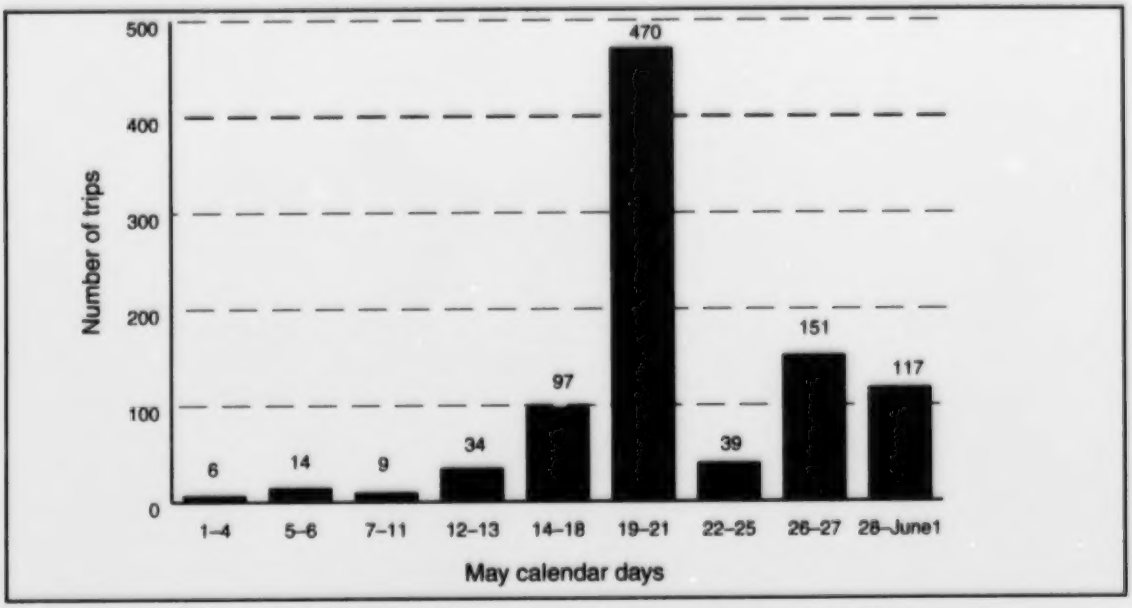

Figure 2. Distribution of camping trips to the Foothills Model Forest, May 1995.

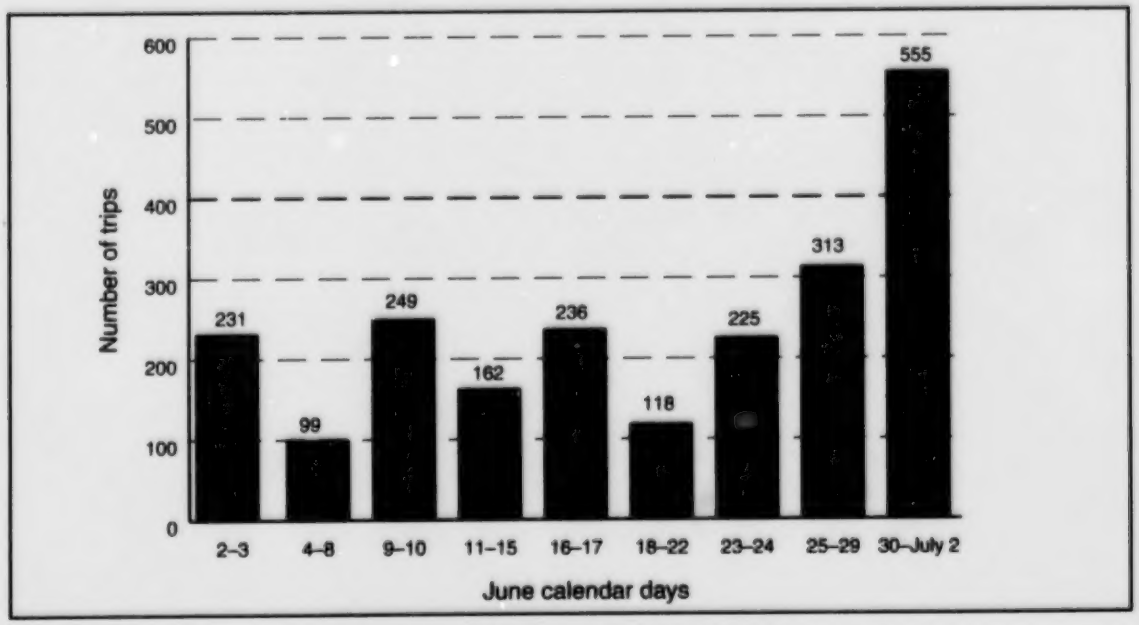

Figure 3. Distribution of camping trips to the Foothills Model Forest, June 1995.

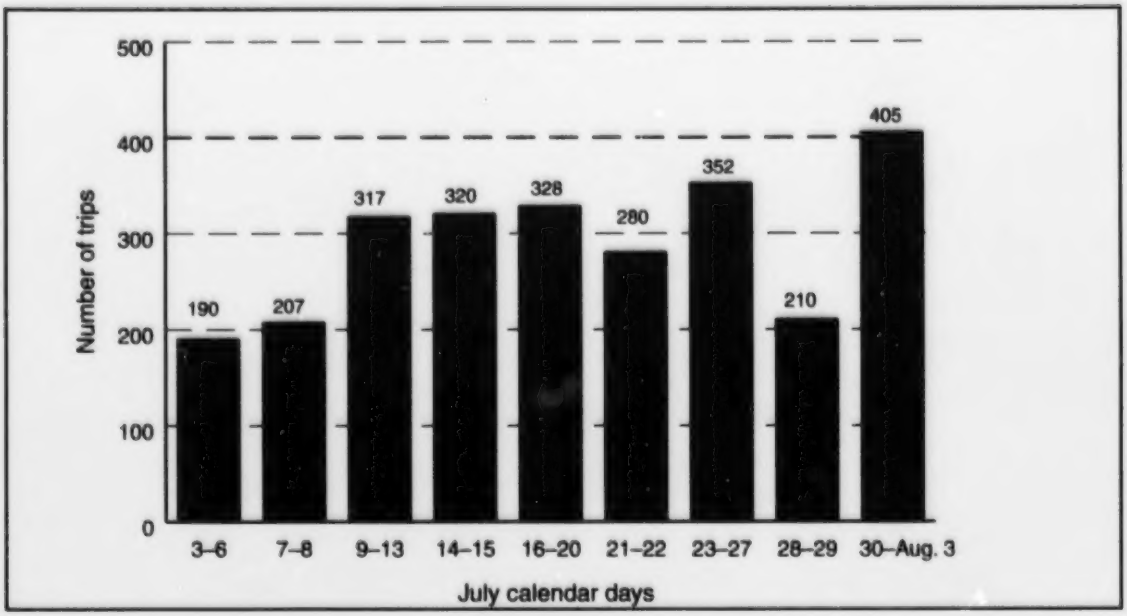

Figure 4. Distribution of camping trips to the Foothills Model Forest, July 1995.

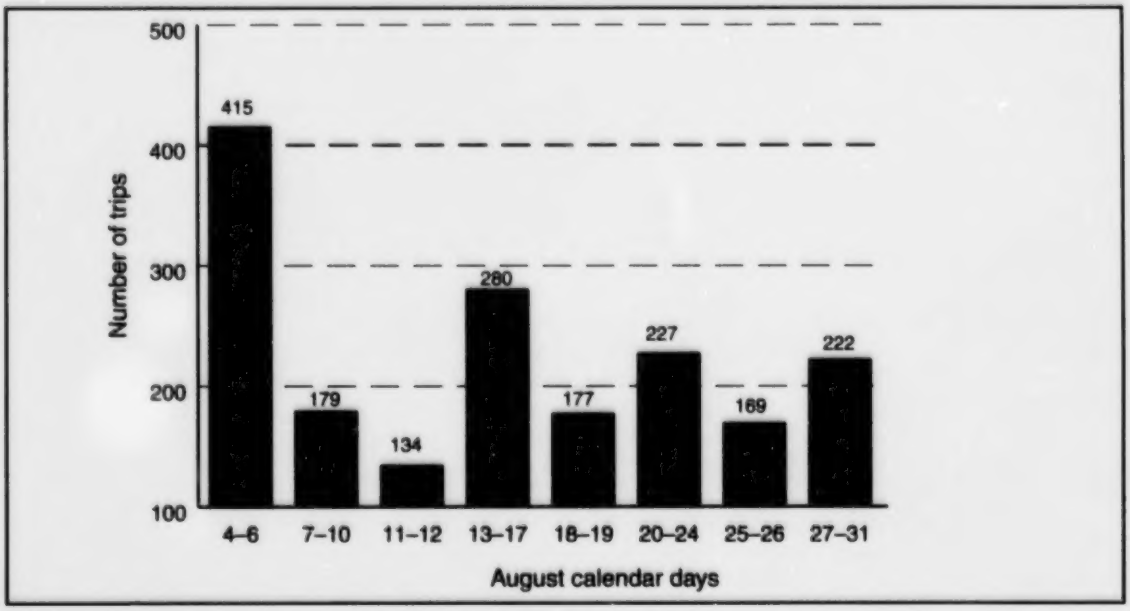

Figure 5. Distribution of camping trips to the Foothills Model Forest, August 1995.

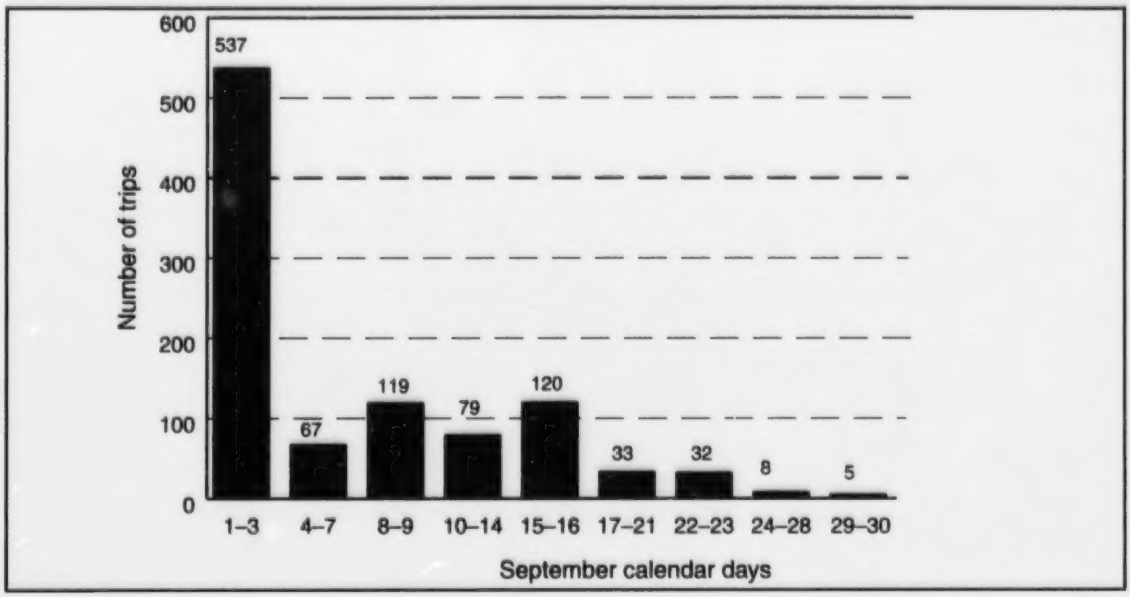

Figure 6. Distribution of camping trips to the Foothills Model Forest, September 1995.

Table 1. Distribution of nights and camping trips to Foothills Model Forest campgrounds

Campground	Total nights	Mean nights	Number of trips	Total trips (%)
Provincial recreation areas				
Big Berland	398	2.00	199	2.3
Coalspur	141	1.41	100	1.2
Emerson Lakes	51	1.59	32	0.4
Fairfax Lake	672	1.78	383	4.4
Fickle Lake	1 540	2.06	754	8.7
Lambert Creek	175	1.61	112	1.3
McLeod River	447	1.81	249	2.9
Obed Lake	281	1.14	247	2.8
Pembina Forks	238	1.62	148	1.7
Pierre Grey's Lakes	2 907	2.14	1 362	15.7
Rock Lake	1 556	2.28	685	7.9
Little Sundance Creek	114	1.68	68	0.8
Watson Creek	854	1.84	468	5.4
Whitehorse Creek	1 467	2.04	726	8.4
Wildhorse/Kinky Lakes	1 061	1.54	689	7.9
William A. Switzer Provincial Park				
Cache Lake	300	1.53	197	2.3
Graveyard	227	1.72	132	1.5
Gregg Lake	2 494	1.87	1 340	15.5
Halfway	188	2.02	93	1.1
Jarvis Lake	1 159	1.69	687	7.9
Total	16 270[a]	1.88	8 671[b]	100.0

[a] An additional 82 nights were spent at unidentified campgrounds.

[b] An additional 61 trips were taken to unidentified campgrounds.

Table 2. Distribution (%) of nights stayed by type of campground[a]

Number of nights	Campground type		
	Provincial recreation areas (n = 6249)	William A. Switzer Provincial Park (n = 2438)	Total campers (n = 8687)
1 (overnight)	47.5	51.6	48.6
2 or 3 (weekend)	44.7	42.1	44.0
More than 3 (vacation)	7.8	6.3	7.4

[a] Goodness-of-fit test of independence: $\chi^2 = 14.74$, 2df, $p = 0.001$.

Table 3. Distribution of multiple trips by individuals to Foothills Model Forest

Number of camping trips	Frequency of individuals	Percentage of individuals
1	5058	83.5
2	670	11.1
3	203	3.4
4	66	1.1
5 or more	59	1.0

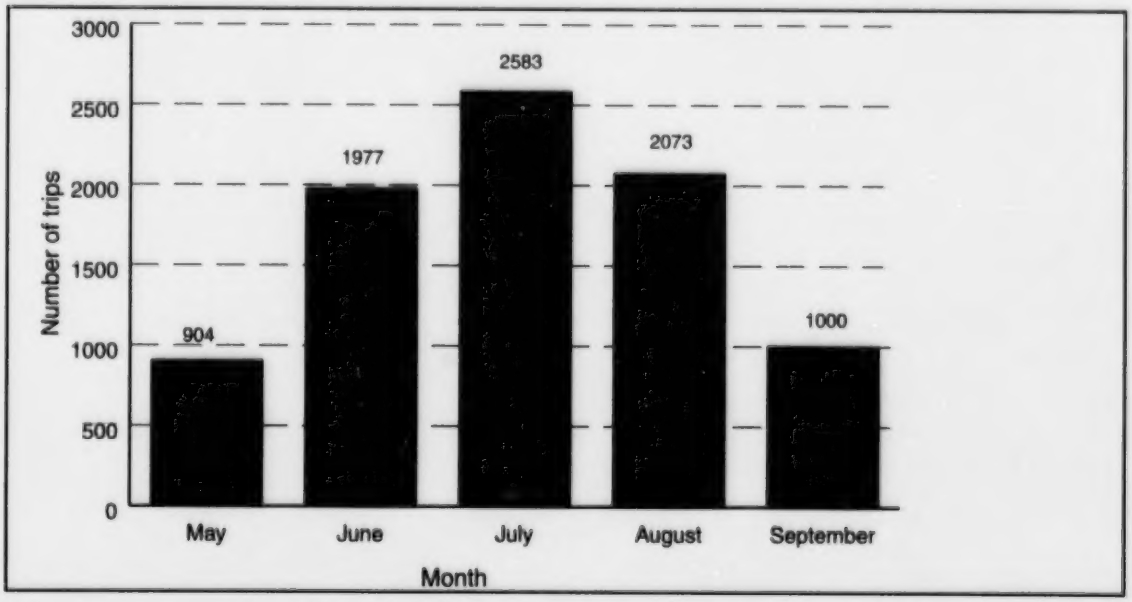

Figure 7. Distribution of camping trips to the Foothills Model Forest by month, May–September (inclusive) 1995.

Table 4. Distribution (%) of camper origin by type of campground[a]

Origin	Campground type: Provincial recreation areas (n = 6064)	Campground type: William A. Switzer Provincial Park (n = 2387)	Total campers (n = 8451)
Alberta	90.2	85.4	88.9
Canada	6.0	9.3	7.0
United States	1.6	3.5	2.0
Other countries	2.2	1.8	2.1

[a] Goodness-of-fit test of independence: $\chi^2 = 64.01$, 3df, $p = 0.000$.

Table 5. Distribution (%) of market areas by type of campground[a]

Market area[b]	Campground type: Provincial recreation areas (n = 5139)	Campground type: William A. Switzer Provincial Park (n = 1881)	Total campers (n = 7020)
Hinton	13.0	33.7	18.5
Edson	7.5	1.8	5.9
Grande Cache	12.6	2.4	9.9
Rural areas	20.0	16.3	19.0
Edmonton	28.6	24.1	27.4
Calgary	1.8	2.7	2.1
Other cities and towns	16.5	19.0	17.2

[a] Goodness-of-fit test of independence: $\chi^2 = 578.2$, 6df, $p = 0.001$.

[b] Based on residents of Alberta with postal codes.

Table 6. Distribution (%) of total people in camping parties by type of campground[a]

Number of people	Campground type: Provincial recreation areas (n = 5564)	Campground type: William A. Switzer Provincial Park (n = 2255)	Total campers (n = 7819)
1	4.7	4.1	4.5
2	47.5	39.5	45.2
3	16.3	13.3	15.4
4	18.5	25.0	20.4
5 or more	13.0	18.1	14.5

[a] Goodness-of-fit test of independence: $\chi^2 = 95.2$, 4df, $p = 0.000$.

a factor in these campgrounds attracting more tourists than the other campgrounds.

Using postal codes, market areas were determined for the campgrounds (Table 5). Although a substantial portion of campers are residents of the local area, most campers were from outside the model forest. About 34% of the trips were from the local communities of Hinton, Edson, and Grande Cache and 19% were from rural areas that are not necessarily in the model forest. About 27% of trips were from Edmonton, 2% were from Calgary, and 17% were from other cities and towns outside the model forest. Examining the market areas for each campground, however, shows that the campgrounds attracted people from different market areas. For example, 50% of the trips to Pierre Grey's Lakes were from Grande Cache and only 12% were from Edmonton. However, residents of Edmonton made up almost 50% of the trips to Lambert Creek, McLeod River, and Watson Creek while 1% or less of trips to Lambert and Watson comprised residents of Hinton.

Visitor Characteristics

A total of 24 115 people camped at the campgrounds during the 1995 camping season. Most of the camping parties comprised two (45%) or four (20%) people (Table 6). Emerson Lakes, Graveyard, and Jarvis Lake attracted more larger camping parties, with over 20% consisting of five or more people. In contrast, Lambert Creek and Obed Lake had more parties of two people, with 66% and 69%, respectively.

Analysis of previous visits to the campgrounds in the last 10 years shows that many campers were new to the campgrounds (Table 7). This does not necessarily mean that the campers had no previous experience in the model forest, only that they had not previously visited the campground where they registered. First-time users comprised 47% of the visitors. Those with moderate experience (one to four previous visits) comprised 24%, and experienced users (five or more previous visits) 28%.

The amount of previous experience varied among the campgrounds. Some campgrounds such as Jarvis Lake, Pierre Grey's Lakes, and Halfway had a larger proportion of visitors who had visited five or more times, with 34%, 56%, and 66%, respectively. Others, such as Obed Lake, Cache Lake, and Gregg Lake, had a larger proportion of first-time visitors, with 80%, 64%, and 65%, respectively.

Comparison of Provincial Recreation Areas and William A. Switzer Provincial Park Campers

The Foothills Model Forest contains two distinct camping opportunities at managed sites: provincial recreation areas and William A. Switzer Provincial Park (hereafter referred to as Switzer Park) campgrounds. Because of the different camping opportunities offered by the two types of campgrounds, comparisons were made between campers at Switzer Park and campers at provincial recreation areas to determine if the campgrounds were attracting different types of campers.

Campers at Switzer Park tended to have more one-night stays and fewer weekend or vacation stays than campers at the provincial recreation areas (Table 2). About 52% of Switzer Park campers stayed only one night, compared to 48% of provincial recreation area campers. Fifty-seven percent of campers at Switzer Park had not been to the campgrounds in the last 10 years, compared with 43% of provincial recreation area users (Table 7). Only 24% had made five or more previous visits, compared to 30% of provincial recreation area users. These results suggest that the park was used by tourists as a stop-over, as does the fact that 15% of campers to Switzer Park were from out-of-province, compared to 10% of provincial recreation area visitors (Table 4). Of those campers from Alberta, a difference occurred in market areas between the types of campgrounds. Thirty-four percent of Switzer Park campers were from Hinton, compared with 13% of visitors to provincial recreation areas (Table 5). Switzer Park also had fewer people from Grande Cache, Edson, rural areas, and Edmonton. Switzer Park campers had larger party sizes, with 43% of the parties consisting of four or more people, while only 32% of provincial recreation area parties had three or more (Table 6).

Travel Cost Model

Maximum likelihood estimates of parameters of the truncated Poisson model are shown in Table 8.

Table 7. Distribution (%) of previous visits by type of campground[a]

Previous visits	Campground type: Provincial recreation areas (n = 4826)	Campground type: William A. Switzer Provincial Park (n = 2204)	Total campers (n = 7030)
0	42.7	57.4	47.3
1	10.7	8.4	10.0
2	7.7	5.2	6.9
3	5.0	2.6	4.3
4	3.8	2.1	3.2
5 or more	30.2	24.3	28.3

[a] Goodness-of-fit test of independence: $\chi^2 = 142.73$, 5df, $p = 0.000$.

Table 8. Parameters from a truncated Poisson count model explaining the number of trips per postal code by Albertans to campgrounds in the Foothills Model Forest

Variables[a]	Parameters	(*t*-ratio)
Intercept	–8.5961	(–42.44)
Travel costs to Rocky-Clearwater Forest (substitute price)	0.0066	(20.42)
Travel costs to Foothills Model Forest (own price)	–0.0172	(–54.63)
Average household income	0.0086	(4.99)
Percentage unemployed	0.0823	(25.00)
Percentage with university education	0.0169	(4.84)
Percentage under age 17	0.0025	(0.54)
Percentage over age 65	–0.0078	(–1.47)
ln(total population)	1.4301	(75.70)
Log likelihood at convergence	–5070.14	

[a] Dependent variable is the number of trips by individuals in an Alberta postal code to the Foothills Model Forest. Independent variables represent postal code percentages or averages. ln(total population) is the natural logarithm of the postal code population.

As with the Rocky-Clearwater Forest, the results suggested that the truncated negative binomial model did not offer distinct advantages regarding overdispersion (see Hellerstein 1991 and Boxall et al. 1996).

The signs and significance of the travel cost parameters for the model are consistent with economic theory (Table 8). The own price parameter is negative, suggesting that the more it costs to travel to the model forest, the fewer the trips taken. The substitute price parameter is positive, suggesting that recreationists living closer to the Rocky-Clearwater Forest are more likely to go there than to the model forest.

The socioeconomic parameters, however, suggest a different pattern of influences on recreation trips to the Foothills Model Forest. The income and employment parameters are positive, suggesting that Albertans from areas with low household income levels take fewer trips to the forest than those with high income levels, and that Albertans residing in areas of high unemployment take more trips to the forest. The education parameter is positive and significant, indicating that Albertans living in areas that contain higher proportions of residents with university educations take more trips to the model forest. The young age parameter is also positive, but not statistically different than zero. The older-age parameter is negative and significant. This indicates

Table 9. Distribution of trips and the aggregate annual nonmarket economic values of Foothills Model Forest campgrounds

Campground	Number of trips	Estimated value (in 1995 dollars)
Provincial recreation areas		
Big Berland	163	9 477
Coalspur	83	4 826
Emerson Lakes	27	1 570
Fairfax Lake	327	19 012
Fickle Lake	709	41 221
Lambert Creek	105	6 105
McLeod River	218	12 675
Obed Lake	118	6 861
Pembina Forks	132	7 674
Pierre Grey's Lakes	1 221	70 988
Rock Lake	641	37 268
Little Sundance Creek	62	3 605
Watson Creek	423	24 593
Whitehorse Creek	674	39 186
Wildhorse/Kinky Lakes	523	30 407
William A. Switzer Provincial Park		
Cache Lake	153	8 895
Graveyard	116	6 744
Gregg Lake	1 121	65 175
Halfway	84	4 884
Jarvis Lake	564	32 791
Total	7 464[a]	433 957

[a] An additional 46 trips were taken to unidentified campgrounds.

that residents in postal codes with high proportions of people over 65 take fewer trips to model forest than residents in postal codes with few older residents.

The Poisson model of trip demand presented above allows the estimation of consumer surplus per predicted trip. While theory dictates that the untruncated model parameters (i.e., those from a model including zero trip quantities) are the correct ones to use in estimating the area under the demand curve, it is convention to use the truncated model parameters (Creel and Loomis 1990; Yen and Adamowicz 1993). This issue has not been dealt with adequately in the literature. The Poisson model has a logarithmic functional form, thus consumer surplus per trip is equal to the negative inverse of the own price travel cost parameter ($-1/\beta_{TC}$) from Table 9.[6] For trips to the Foothills Model Forest during 1995, this results in an estimated value of $58.14 per trip. This consumer surplus estimate is about one-quarter of the estimated average cost of a trip to the model forest. Aggregating this over the 7510 trips taken by Albertans yields an estimated value of $436 631 for the service flow associated with camping at the formal sites in the Foothills Model Forest for 1995. Note that this estimate is in addition to the revenue generated by fees to campground managers and does not include any other expenditures unrelated to travel costs made by campers (e.g., food, rentals, etc.).

[6] See Adamowicz et al. (1989) for a description of how this result is obtained.

These estimates can also be used to assess the value of individual campgrounds in the model forest. The number of trips to each campground was multiplied by the per-trip value of $58.14, and the resulting distribution of values is shown in Table 9. Those campgrounds that generated the most visits generated the largest nonmarket economic benefits.

DISCUSSION

This study showed that campers are important users of the Foothills Model Forest. Camping parties spent over 16 000 nights at managed campgrounds in 1995, representing over 24 000 people. These numbers indicate that campers are an important group that should be included in natural resource management decisions. Understanding how natural resource management will affect this user group, the products of management that have value, and acceptable management actions for this group is crucial to incorporating social values into management decisions in the forest.

The data indicated that campers at managed sites in the model forest are primarily weekend campers who make the campgrounds their primary destination. While a large proportion of campers were residents from local communities, most visitors were from outside the model forest. Most campers to the model forest had not been to the campgrounds before.

Differences were observed between campers at provincial recreation areas and at Switzer Park. Switzer Park tends to attract more out-of-province visitors and campers with short stays, suggesting a larger tourism segment is visiting the provincial park than the provincial recreation areas; nonetheless, Switzer Park is also very popular with residents of Hinton.

The aggregate value of camping estimates the annual nonmarket economic return of camping services provided by the land base in the Foothills Model Forest. This nonmarket economic return can be compared with the economic value of forestry or the oil and gas industry in the model forest. However, it must be emphasized that the land base in the Foothills Model Forest provides more than camping services at managed sites. There are also economic returns that relate to other uses such as random camping, hunting and fishing, hiking, snowmobiling, and trail riding. To provide a more accurate assessment of the benefits derived from the model forest, nonmarket values relating to all of these unpriced goods and services should be determined and included in the valuation of the resource.

A number of comments on the economic values seem warranted. First, the estimated per-trip value appears somewhat higher than other per-trip estimates for camping in forested areas in the U.S. (e.g., Sorg and Loomis 1984; Richards and Brown 1992). The estimate, however, is not that much higher once exchange rates and inflation are taken into account. Furthermore, it is comparable to the value of a trip to the Rocky-Clearwater Forest, which is $52.63 per trip (Boxall et al. 1996). Unfortunately, there are virtually few, if any, other Canadian studies of similar recreational activities that can be compared with this study.

The aggregate benefit estimate, on the other hand, does not seem too different from those reached in similar studies from the U.S. For example, Hellerstein (1991) reports aggregate annual surplus estimates of about $1.32 million to $1.69 million (U.S.) for the Boundary Waters Canoe Area, and Richards and Brown (1992) report annual estimates of $48 000 to $111 000 (U.S.) for single campgrounds in Arizona.

It is also important to note that the estimates generated in this analysis are static. This means that any significant environmental impacts or resource management changes will not be reflected in the value estimates. This is a result of the omission of environmental variables in generating the demand function (Table 8). Any significant changes of an environmental or management nature will increase or decrease the per-trip value

from the benchmark established in this analysis. The model used in this paper will capture changes in socioeconomic effects as they influence the socioeconomic characteristics of individuals residing in the postal codes used in the model. Work is now under way to include environmental and resource management variables as influences in the travel cost models.

Finally, it is important to note that the value of camping estimated here only considers the values held by Albertans. As with most travel cost models, nonresidents have been excluded from the analysis due to difficulties incorporating them in the analyses (Hellerstein 1991). This is not inappropriate though, because the land base being considered is largely public land, and Alberta residents' concerns should be paramount in the management of these areas.

This type of information should be evaluated for its potential in the determination of criteria and indicators for nontimber values of sustainable management in the model forest. Establishing a system to monitor camping use and tracking changes over time will be essential in the evaluation of criteria and indicators.

ACKNOWLEDGMENTS

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